Epidemiologic and economic evaluation of different forms of tobacco prevention for Switzerland: an analysis of exemplary interventions using secondary data

Rehm, Jürgen ; Zahringer, S ; Egli, S ; Patra, J

Suchtforschung des BAG
Recherches de l'OFSP en matière de dépendances 2002–03

Band 2/3: Prävention
Volume 2/3: Prévention

Band
Volume
2

BAG OFSP UFSP SFOPH

Suchtforschung des BAG
Recherches de l'OFSP en matière de dépendances 2002–03

Band 2/3: Prävention
Volume 2/3: Prévention

BAG OFSP UFSP SFOPH

Impressum

Herausgeber
Bundesamt für Gesundheit
Office fédéral de la santé publique
Ufficio federale della sanità pubblica
Uffizi federal da sanadad publica
Swiss Federal Office of Public Health

Publikationszeitpunkt: August 2006

Weitere Informationen
BAG, Direktionsbereich Öffentliche Gesundheit, Abteilung Nationale Präventionsprogramme, Sektion Grundlagen, 3003 Bern
Telefon +41 (0)31 323 87 93, Telefax +41 (0)31 322 87 89

Bezugsquelle
BBL, Verkauf Bundespublikationen, CH-3003 Bern
www.bbl.admin.ch/bundespublikationen
Verkaufspreis/prix de vente: CHF 27.40 inkl. MwSt.

BBL-Artikelnummer: 311.820.2
BAG-Publikationsnummer: BAG OeG 8.06 1'000 kombi 24EXT06001 153523
ISBN 3-905235-52-8

Gedruckt auf chlorfrei gebleichtem Papier

Inhaltsverzeichnis/Table des matières

Kapitel 4/Chapitre 4: Gesellschaftsbezogene Forschung/Recherches portant sur les aspects de société

Epidemiologic and Economic Evaluation of Different Forms of Tobacco Prevention for Switzerland: an Analysis of Exemplary Interventions Using Secondary Data*

Jürgen Rehm, Susanne Zähringer, Samy Egli, Jayadeep Patra, Research Institute for Public Health and Addiction ISGF, Zurich

Summary

Based on a systematic literature review, three exemplary interventions to reduce tobacco-related harm were selected and their impact was assessed:
1. nicotine replacement therapies;
2. taxation increases;
3. community interventions.
Specifically, impact was assessed by modeling with respect to:
– Effects on reducing prevalence rates of cigarette smoking in Switzerland;
– Effects on population attributable fractions for lung cancer and coronary heart disease. These conditions were selected because they constitute the major tobacco-related burden of disease in established market economies.
– Effects on reductions of disease-specific mortality for Switzerland.
Taxation measures and nicotine replacement therapy have effected a sizeable reduction in mortality for both lung cancer and coronary heart disease. In realistic scenarios, between 3.3% and 4.2% of lung cancer mortality, and between 2.5% and 2.8% of coronary heart disease mortality could be reduced by these interventions within one year. However, in large controlled studies community interventions for reducing smoking, did not show any effects larger than what may be produced by chance and were not modeled further.
With respect to cost-effectiveness, taxation increases are clearly more cost-effective than nicotine replacement therapies, as intervention is not necessary at the level of the individual smoker. The implications of these findings are discussed below. Future research should focus on interventions to optimize reductions in tobacco-related harm. However, the modeling of the three interventions described has already indicated important directions for potential interventions.
It is clear that cost-effective anti-smoking interventions are available, offering the potential to reduce the smoking-related burden of disease in Switzerland within a short period of time.

Key Words

Tobacco
Interventions
Mortality
Lung Cancer
Coronary Heart Disease
Cost-Effectiveness

1. Introduction

Based on recent publications (Ezzati et al., 2002; Shibuya et al., 2003), we decided to model the impact of different interventions in burden of disease terms. This procedure can be justified by the fact that for tobacco use – in contrast to alcohol and illicit drugs use – the overwhelming majority of direct costs materializes in health care (see Single et al., 1996, 1998). We used two tracer diagnoses to operationalize burden of disease: lung cancer and coronary heart disease, diagnoses which account for the majority of tobacco-related mortality and burden of disease both in established market economies and also globally (WHO, 2002).

To estimate tobacco-attributable mortality and burden of disease for both risk factor-disease pairs, population attributable fractions were calculated using standard epidemiological techniques (Walter, 1976; 1980). Population attributable fractions denote the proportion of mortality of a disease which is caused by a given risk factor, in this case tobacco.

2. Methods

Exposure to smoking was taken from the Swiss Health Survey (Schweizerische Gesundheitsbefragung) 2002. Details of this survey can be obtained from the website of the Swiss Federal Office of Statistics (www.bfs.admin.ch and www.statistik.admin.ch./stat-ch/ber14/dtfr14-s.htm).

In order to model smoking behaviour in a society with a socio-political climate exerting pressure towards reducing smoking rates we assumed four different scenarios based on the literature, trends observed in regions of North America and Australia featuring intense efforts to reduce tobacco related harm (see, for example www.sfa-ispa.ch; Tillgren et al., 1995; Bondy et al., 2000). These scenarios were based on:

– quitting rates of 5%/10%/15%/25%;
– the assumption that 80% of smokers wanted to quit,
– the assumption of an annual incidence rate of 0.46% for current female non-smokers, and a prevalence proportionate incidence rate for males.

* This project was supported by the Swiss Federal Office of Public Health, contract number 02.001044.

We modeled the *risk relations* between smoking and disease outcomes based on English et al. (1995). This model avoids sole reliance on one study, which is the major problem of SAMNEC and other ready-made software. (SAMNEC is based on the American Cancer Society CPS-2 Study Proceedings of the Workshop on Changing Mortality Roles of Tobacco-Related Diseases, 1997.) We used sex- and age-specific estimates for coronary heart disease, and sex-specific ones for lung cancer.

Based on the literature, three kinds of *interventions* were modeled as examples:

– nicotine replacement therapies
– taxation increases
– community interventions for reducing smoking

For each we estimated the effect on prevalence, the subsequent change in attributable fraction and the estimated reduction in disease prevalence.

3. Results

The results showed a sizeable reduction in mortality for both lung cancer and coronary heart disease for both taxation and nicotine replacement therapy. In realistic scenarios, between 3.3% and 4.2% of lung cancer mortality, and between 2.5% and 2.8% of coronary heart disease mortality could be reduced by these interventions within one year (for details see tables below as well as Rehm et al., 2004). Community interventions in large controlled studies did not show effects larger than chance in reducing smoking and thus were not modeled further. Tables 1 and 2 show the proportional mortality reduction in different scenarios for nicotine replacement therapies and taxation decreases.

We refrained from applying a formal cost-effectiveness analysis (e.g. Chisholm et al, 2004; Drummond et al., 1997; Shibuga et al, 2003; Tan-Torres Edejer et al., 2003) as the results would not have helped clari-

Table 1: Proportional mortality reduction in percent in first year resulting from nicotine replacement therapy (NRT) interventions

Scenarios	Females		Males	
	Lung cancer	Coronary heart disease	Lung cancer	Coronary heart disease
Prevalence of 2002	76.78	34.68	85.05	43.42
'Natural course' 5% reduction (–5%)	0.8	0.5	0.3	0.3
'Natural course' –10%	2.3	1.4	1.6	1.4
'Natural course' –15%	3.8	2.3	3.0	0.9
'Natural course' –5% plus NRT on all willing to change	2.0	1.2	1.4	1.2
'Natural course' –10% plus NRT on all willing to change	4.7	2.8	3.8	3.3
'Natural course' –15% plus NRT on all willing to change	7.5	4.5	6.3	5.4
'Natural course' –5% plus NRT on 75% willing to change	1.7	1.0	1.1	0.9
'Natural course' –10% plus NRT on 75% willing to change	*4.1*	*2.5*	*3.3*	*2.8*
'Natural course' –15% plus NRT on 75% willing to change	6.5	3.9	5.5	4.7
Most optimistic scenario –25% plus NRT on all willing to change	12.8	7.8	11.7	10.1

Most realistic scenario is highlighted in italics.
The natural course assumption is modeled only on 80% of the smokers, assuming that only 80% would like to reduce smoking or quit.

Table 2: Proportional mortality reduction in percent in first year resulting from taxation

Scenarios	Females		Males	
	Lung cancer	Coronary heart disease	Lung cancer	Coronary heart disease
Prevalence of 2002	76.78	34.68	85.05	43.42
'Natural course' 5% reduction (–5%); tax increase 0.50 CHF; elasticity –.25	1.8	1.1	1.2	1.0
'Natural course' –10%; tax increase 0.50 CHF; elasticity –.25	3.3	2.0	2.5	2.2
'Natural course' –15%; tax increase 0.50 CHF; elasticity –.25	4.8	2.9	3.9	3.3
'Natural course' –25%; tax increase 0.50 CHF; elasticity –.25	7.8	4.7	6.6	5.6
'Natural course' –5%; tax increase 0.50 CHF; elasticity –.50	2.7	1.6	2.0	1.7
'Natural course' –10%; tax increase 0.50 CHF; elasticity –.50	*4.2*	*2.5*	*3.3*	*2.8*
'Natural course' –15%; tax increase 0.50 CHF; elasticity –.50	5.1	3.4	4.7	4.0
'Natural course' –25%; tax increase 0.50 CHF; elasticity –.50	8.7	5.3	7.4	6.3
'Natural course' –5%; tax increase 1.00 CHF; elasticity –.25	2.7	1.6	2.0	1.7
'Natural course' –10%; tax increase 1.00 CHF; elasticity –.25	4.2	2.5	3.3	2.8
'Natural course' –15%; tax increase 1.00 CHF; elasticity –.25	5.1	3.4	4.7	4.0
'Natural course' –25%; tax increase 1.00 CHF; elasticity –.25	8.7	5.3	7.4	6.3
'Natural course' –5%; tax increase 1.00 CHF; elasticity –.50	4.5	2.7	0.5	3.0
'Natural course' –10%; tax increase 1.00 CHF; elasticity –.50	6.0	3.6	4.9	4.2
'Natural course' –15%; tax increase 1.00 CHF; elasticity –.50	7.5	4.5	6.3	5.4
'Natural course' –25%; tax increase 1.00 CHF; elasticity –.50	10.5	6.3	9.0	7.7

Most realistic scenario is highlighted in italics.
The natural course assumption is modeled only on 80% of the smokers, assuming that only 80% would like to reduce.

fy the conclusions. Taxation is clearly the most cost-effective of the interventions examined. It yields about the same level of mortality reduction as nicotine replacement therapies, but requires only a fraction of the cost. For nicotine replacement therapies, we are faced with the resource needs of the supply of nicotine gum or other forms of nicotine replacement for more than one million Swiss smokers, even if only 75% of those willing to quit were reached. While an effort of this kind may be effective in reducing prevalence rates, and even cost-beneficial (Drummond et al., 1987) given the high costs of smoking in Switzerland (Vitale et al, 1998), it is certainly not cost-effective for the government in comparison with alternatives like taxation increases. Overall Swiss taxes on cigarettes are not high compared with those in other European countries. This analysis remains valid despite the possibility that taxation increases may increase cross-border smuggling of tobacco products, and consequently lead to an increase in law enforcement costs.

As for community interventions, it makes no sense to consider their cost-effectiveness, since these programmes have not been found effective.

4. Discussion

Both nicotine replacement therapies and taxation increases could reduce the tobacco-related burden for Switzerland. While we modeled only these exemplary approaches, there are other approaches which have been proven effective in rigorous evaluations, such as active enforcement of laws on minors (Stead & Lancaster, 2002). Overall, the literature clearly converges on the view that societal approaches involving laws and regulations are both effective and cost-effective in reducing tobacco-related harm (Cummings, 2002). It remains unclear if there is a point at which these measures will become less effective, as they may not influence more hardened smokers, but certainly as far as Switzerland is concerned, this point is not yet in sight.

5. Recommendations

Taxation should be considered as the first line intervention for reducing tobacco-related harm.

6. References

1. Bondy SJ, Cohen JE, Rehm J. (2000) Past trends in tobacco use and some thoughts on future trends. In: Ferrence R, Slade J, Room R, Pope M, Eds. Nicotine and Public Health. Washington: American Public Health Association, 2000: 311–25.
2. Chisholm D, Rehm J, van Ommeren M, Monteiro M. Reducing the global burden of hazardous alcohol use: a comparative cost-effectiveness analysis. Journal of Studies on Alcohol 2004;65:782–93.
3. Cummings KM. Programs and policies to discourage the use of tobacco products. Oncogene 2002;21:7349–64.
4. Drummond MF, O'Brien B, Stoddart GL, Torrance GW. Methods for the Economic Evaluation of Health Care Programmes. Second Edition. New York: Oxford University Press, 1997.
5. English DR, Holman CDJ, Milne E, Winter MJ, Hulse GK, Codde G, et al. The quantification of drug caused morbidity and mortality in Australia 1995. Canberra, Australia: Commonwealth Department of Human Services and Health, 1995.
6. Ezzati M, Lopez AD, Rodgers A, Vander Horn S, Murray CJL and the Comparative Risk Assessment Collaborating Group. Selected major risk factors and global and regional burden of disease. The Lancet 2002;360:1347–60.
7. Proceedings of the Workshop on the Changing Mortality Rates of Tobacco-Related Diseases: American Cancer Society CPS-1 and CPS-2 Studies. New York, April 15, 1996.
8. Rehm J, Zähringer S, Egli S, Patra J. Epidemiologic and economic evaluation of different forms of tobacco prevention for Switzerland. An analysis of exemplary interventions using secondary data. Zurich: Addiction Research Institute, 2004 (Forschungsbericht aus dem Institut für Suchtforschung Nr. 189).
9. Shibuya K, Ciecierski C, Guindon E., Bettcher DW, Evans DB, Murray CJ. WHO Framework Convention on Tobacco Control: development of an evidence based global public health treaty. BMJ 2003;327:154–7.
10. Single E, Robson L, Xie X, Rehm J. The economic costs of alcohol, tobacco and illicit drugs in Canada, 1992. Addiction 1998; 93:991–1006.
11. Single E, Robson L, Xie X, Rehm J. The Cost of Substance Abuse in Canada. Ottawa, Ontario: Canadian Centre on Substance Abuse, 1996.

12. Stead LF, Lancaster T. Interventions for preventing tobacco sales to minors. Cochrane Database Syst Rev. 1, 2002.
13. Swiss Federal Office of Statistics. Swiss Health Survey (Schweizerische Gesundheitsbefragung) 2002 (www.bfs.admin.ch and www.statistik.admin.ch./stat-ch/ber14/dtfr14-s.htm).
14. Tan-Torres Edejer T, Baltussen R, Adam T, Hutubessy R, Acharya A, Evans DB, Murray CJL. Making Choices in Health: WHO Guide to Cost-Effectiveness Analysis. Geneva: World Health Organization, 2003.

7. Valorisation

We hope that this study will contribute to evidence-based interventions to further reduce tobacco-related harm in Switzerland.

Correspondence to:
Prof. Dr. Jürgen Rehm
Institut für Sucht- und Gesundheitsforschung
Konradstrasse 32
Postfach
CH-8031 Zürich
jtrehm@isgf.unizh.ch
Phone: +41 44 448 11 60
Fax: +41 44 448 11 71